Space Weather Forecast

Issued on Wednesday, 12 July 2023 at 13:30 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: G1/Minor Storm likely, chance of G2/Moderate Storm on 13 July with CME arrival. Chance of R1/R2 Radio Blackouts throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: High, with three R2 blackouts and seven R1 blackouts and 12 sunspots on the disc. The strongest flares of the moderate flares were all from a large sunspot on the northeast limb. This is a large region but remains difficult to assess due to its location. More complexity is likely to become apparent it moves into a less oblique viewing angle. A number of smaller Moderate flares have been observed from other regions on the disc, including a small region in the northwest, and two further regions in the southwest. The large and mature sunspot in the south centre disc is the other region of interest, with ongoing development around its periphery. Despite the current lack of activity from this region, its strong magnetic field gives the potential for Moderate to Strong flares.

A CME (coronal mass ejection) was produced from a filament eruption to the south of the large sunspot around 11/1830 UTC. The bulk of the material has been assessed as passing mainly below Earth, but with a likely glancing blow occurring on day 3 (14 Jul).

Solar Wind / Geomagnetic Activity: The solar wind was at slow levels throughout and varied between 320-360 km/s. Total magnetic field strength has been weak to moderate throughout, whilst the north-south component was weak. Geomagnetic activity has been at Quiet levels throughout (Kp 1-2).

Energetic Particles / Solar Radiation: No solar radiation storms were observed with the count rate of energetic particles (high energy protons) at background.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate solar activity is most likely through the period, with a slight chance of an isolated Strong flare.

Solar Wind / Geomagnetic Activity: There are two glancing CMEs potentially arriving. The first associated with a Moderate flare on 10 Jul, with an arrival time of around 13/0600 UTC most likely, but confidence is rather low. A further glancing CME arrival is expected during the first half of day 3 (14 Jul) due to the filament eruption on the 11 Jul. Otherwise background solar wind is expected to become enhanced due to the arrival of fast winds from a coronal hole on day 2 (13 July). The combination of CME and coronal hole effects could lead to increased geomagnetic impacts. Geomagnetic activity is forecast to be Quiet (Kp 0-2) at first, becoming Active to G1/Minor Storm (Kp 4-5) with a small chance of G2/Moderate Storm intervals (Kp 6) day 2 (13 July). Conditions likely easing for a time, before rising again to give a chance of G1-G2 Minor to Moderate storms with the second CME glance on day 3 (14 Jul). Activity then easing to Quiet to Active day 4 (15 Jul).

Energetic Particles / Solar Radiation: Solar radiation has a slight chance of reaching the S1/Minor Storm threshold through the period, should a larger flare occur.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	30	40	10
Strong	G3	No	1	5	10	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	80	70	60
Very Active	R3 to R5 X	No	20	20	15	10

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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